

the 11th Tyr, 16th Glu, 49th Asn, 84th Glu, 144th Ser, 167th Gln, 169th Tyr, 178th Ala, 188th Glu, 190th Asn, 205th His and 209th Gln, and

wherein said mutant α -amylase possesses increased heat resistance, which can be improved by combining mutations, and maintains resistance to chelating agents and oxidizing agents when compared to SEQ ID NO:1, and

said mutant α -amylase comprises an amino acid sequence which is at least 95% homologous to SEQ ID NO:1.--

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--13. A mutant α -amylase obtained by making a substitution or deletion of at least one amino acid residue of specific positions in SEQ ID NO:1, or by making a substitution or deletion of at least one amino acid residue corresponding to the above-mentioned amino acid residue in a sequence having at least 95% homology to SEQ ID NO:1,

wherein said at least one amino acid residue is selected from the group consisting of:

the 11th Tyr, 16th Glu, 49th Asn, 84th Glu, 144th Ser, 167th Gln, 169th Tyr, 178th Ala, 188th Glu, 190th Asn, 205th His and 209th Gln, and

wherein said mutant α -amylase:

(i) decomposes α -1,4-glycoside bonds of starch, amylose, amylopectin, and partially decomposed products thereof;

(ii) produces glucose, maltose, maltotriose, maltotetraose, maltopentaose, maltohexaose, and maltoheptaose from amylose;

(iii) does not act on pullulan;

(iv) exhibits a residual activity of at least 70% in a pH range of 6.5 to 11 under treatment conditions of 40°C and 30 minutes;

(v) acts in a temperature range of 20°C to 80°C;

(vi) exhibits a residual activity of at least 80% when incubated at 40°C, or at least 60% when incubated at 45°C, for 30 minutes in 50 mM glycine-sodium hydroxide buffer at pH 10;

(vii) has a molecular weight of 55,000 \pm 5,000 as measured by sodium dodecyl sulfate (SDS) polyacrylamide gel electrophoresis;

(viii) has an isoelectric point of about 4.2 as measured by isoelectric focusing;

(ix) has a residual activity of at least 90% when treated at pH 10 and 30°C for 30 minutes in a 0.1% solution of a surfactant selected from the group consisting of:

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sodium linear alkylbenzenesulfonates, sodium alkylsulfates, sodium polyoxyethylene alkylsulfates, sodium α -olefinsulfonates, sodium salts of α -sulfonated fatty acid esters, sodium alkylsulfonates, SDS, soap, and Softanol;

(x) is inhibited by 1 mM Mn^{2+} by about 75%, or by 1 mM Sr^{2+} or 1 mM Cd^{2+} by about 30 to 40%, when treated at pH 10 and 30°C for 30 minutes; and

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(xii) comprises an amino acid sequence which is at least 95% homologous to SEQ ID NO:1.--

--14. The mutant α -amylase of claim 13, wherein said mutant α -amylase acts in an optimum temperature range of 50°C to 60°C.--

Attached hereto is a marked-up version showing the changes made to the application by these amendments.